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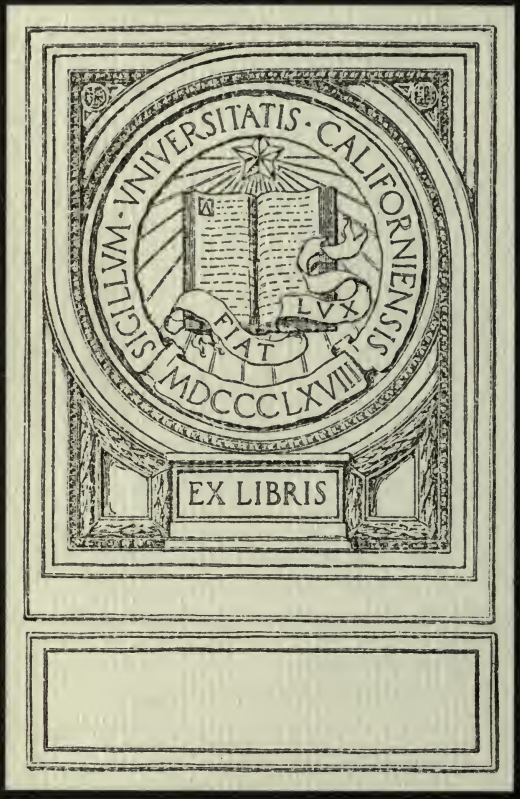
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Manual Training
FOR THE
Rural Schools

LOUIS M. ROEHL

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Manual Training for the Rural Schools

A GROUP OF

Farm and Farm Home Woodworking Problems

By

Louis M. Roehl

Director of Farm Mechanics,
Milwaukee County School of Agriculture
and Domestic Economy,
Wauwatosa, Wisconsin

The Bruce Publishing Company
MILWAUKEE, WIS.

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PREFACE

THIS book, "Manual Training for the Rural Schools," as its name implies, is a set of woodworking problems especially adapted for the rural schools. It is planned as a textbook to be used by the pupils. The material used in all of the problems is such as may be obtained locally by any teacher in the country schools and the problems are within the capacity of rural school pupils.

It is suggested to those beginning woodwork that they follow closely the directions for reducing a piece of stock to dimensions, observing closely the illustrations of the tool operations referred to.

The problems consist of practical articles which are used in the home and about the farm in performing the various farming operations.

416032

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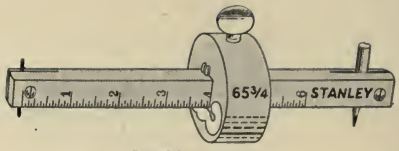
WOODWORKING EQUIPMENT FOR COUNTRY SCHOOLS

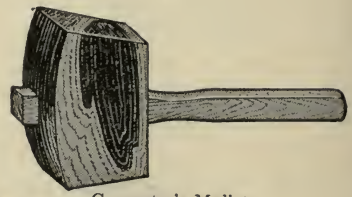
1—22-inch Hand Rip Saw 8 Point	$1.50
1—22-inch Hand Cross Cut Saw 8 Point	1.50
1—Claw Hammer, 12 oz. Straight Claw, Plain Face	.55
1—Jack Plane, 14-inch with 2-inch Cutter	2.15
1—Try Square, 8 inch	.35
1—T bevel, 8 inch	.30
1—Marking Gauge No. 0	.10
1—Divider, 8 inch	.35
1—Carpenter's Mallet, $2\frac{3}{4}$x$3\frac{3}{4}$ inches	.25
1—2-foot Four Fold Rule, Brass Bound	.35
1—$\frac{1}{4}$-inch Socket Firmer Chisel	.35
1—$\frac{1}{2}$-inch Socket Firmer Chisel	.35
1—$\frac{3}{4}$-inch Socket Firmer Chisel	.40
2—Bench Stops	.10
1—8-inch Bench Brush	.35
1—12-inch Handy Saw	1.25
1—Steel Rafter Framing Square	1.75
1—Bench Hook	.35
1—6-inch Screw Driver	.30
1—10-inch Screw Driver	.50
1—Ratchet Brace, 12-inch Sweep	1.10
1—10-inch Flat Bastard Mill File, with Handle	.25
1—6-inch Slim Taper Triangular File, with Handle	.10
1—8-inch Drawing Knife	.70
1—Nail Set, 3-32 inch	.10
1—Rose Countersink	.15
1—Set Twist Drill Bits	1.25
1—2x8-inch Combination Grinding Stone	1.00
1—Special Saw Set	.40
1—6-inch Combination Plier	.30
1—Putty Knife	.15
1—Set of Six Auger Bits, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch	1.50
1—Coping Saw, Nickel Plated, Wire Frame	.25
	$20.35

Hand Rip Saw.



Marking Gauge.

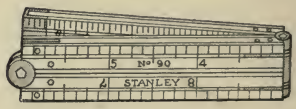
Claw Hammer.



Carpenter's Mallet.

Stanley Steel Square.

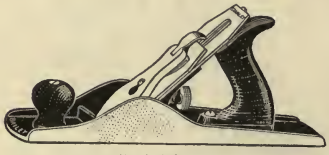
Divider.



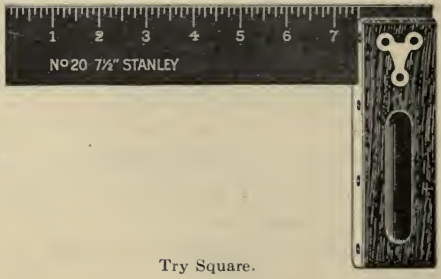
Two-Foot, Four Fold Rule.

Socket Firmer Chisel.

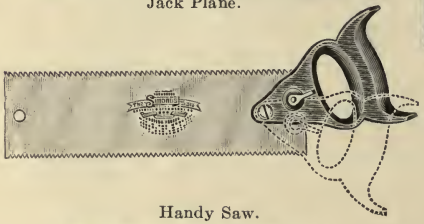
Screw Driver.



Jack Plane.

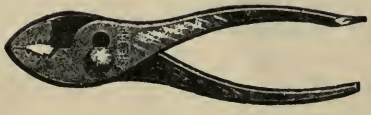


Try Square.

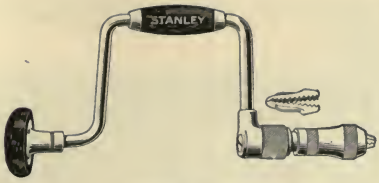


Handy Saw.

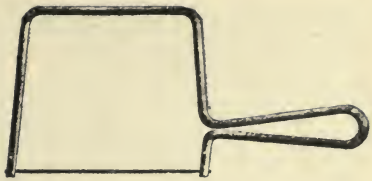
Eight-Inch T Bevel.



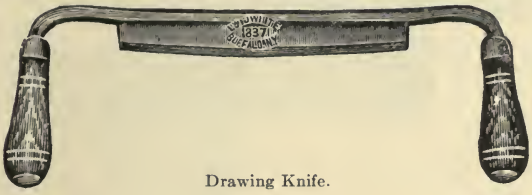
Combination Plier.



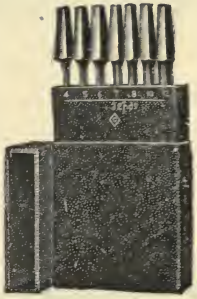
Ratchet Brace.



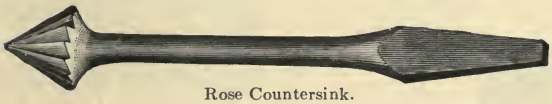
Coping Saw.



Drawing Knife.

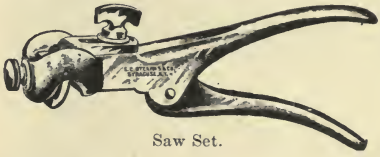


Set Twist Drill Bits.



Rose Countersink.

Combination Grinding Stone.



Saw Set.

Flat Bastard Mill File.

Slim Taper Triangular File.

Auger Bit.

Putty Knife.

DIRECTIONS FOR REDUCING STOCK TO DIMENSIONS

1—Plane one side smooth and mark "I." Call this side the working face. Fig. 1.

Fig. 1. Holding Wood Between Bench Pegs and Planing Surface.

Fig. 2. Edge Planing.

2—Plane one adjoining edge at right angles to surface "I" and mark "II." Call this edge the working edge. Fig. 2.

3—Draw a line across surface "I" near one end at right angles to surface "II," and remove the end stock to line with saw or plane. Mark end surface "III." Call this end the working end. Fig. 3, Fig. 4.

Fig. 3. Squaring the End with Try Square and Pencil.

4—Measure off the length of the required piece on surface "I" from the end surface "III," and reduce stock to length with saw or plane. Fig. 4.

Fig. 4. Sawing Cross Grain on Bench Hook with Back or Handy Saw.

Fig. 4a. End Planing with a Block Plane.

4a—The end may be trimmed with a block plane as shown. Fig. 4a.

5—Measure off the width of the required piece on surface "I" from edge "II" and remove stock to line with plane.

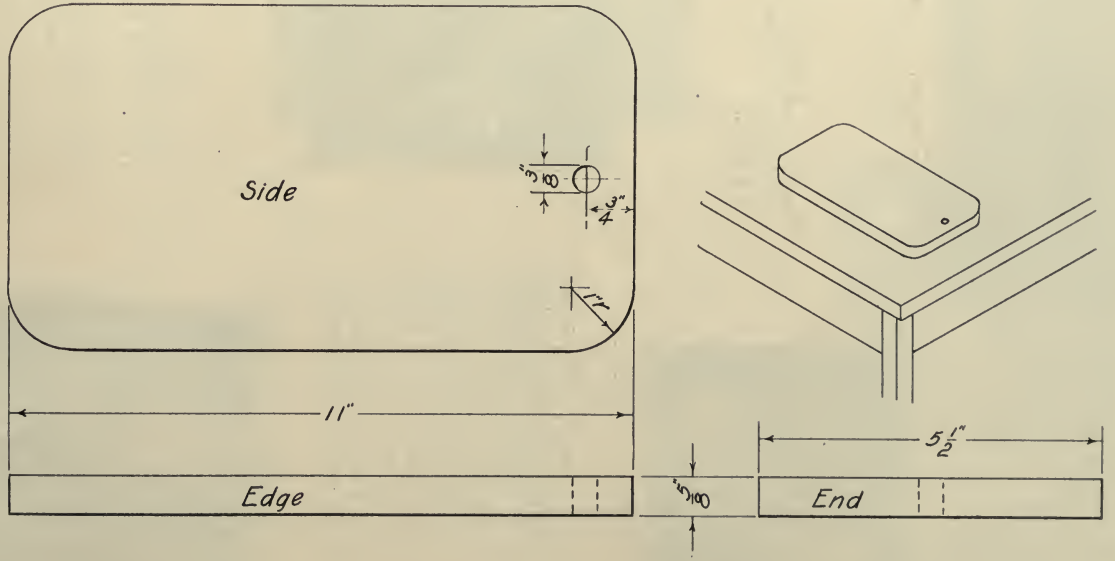
6—With marking gauge set at the thickness of the required piece, measure off the thickness of the required stock from surface "I" and remove stock to line with plane. Fig. 5.

Fig. 5. The Marking Gauge in Use.

Fig. 6. Testing to See if End is Square with the Edge.

6—In reducing a piece of wood to dimensions the try square should be used constantly, to obtain right angles with the adjoining surfaces. The stock should be removed to the line but the line should never be cut away. Fig. 6.

Bread Board



BREAD BOARD

Material Required

Lumber: 1 piece basswood, poplar or white pine $\frac{7}{8}$x5$\frac{5}{8}$x11$\frac{1}{2}$ inches.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, $\frac{3}{8}$ inch bit, $\frac{3}{4}$ inch chisel, marking gauge, dividers.

Stock Bill

Pieces.	Finished Dimensions.
1.	$\frac{5}{8}$x5$\frac{1}{2}$x11 inches.

Fig. 7. Swinging an Arc with a Compass.

Fig. 8. Chiseling with the Grain.

Directions

1—Reduce stock to finished dimensions following the above directions.

2—To lay out round corners locate points at each corner on both sides 1 inch from end and 1 inch from edge, and with dividers set at a 1-inch radius swing an arc across the corner to edge and end. Fig. 7.

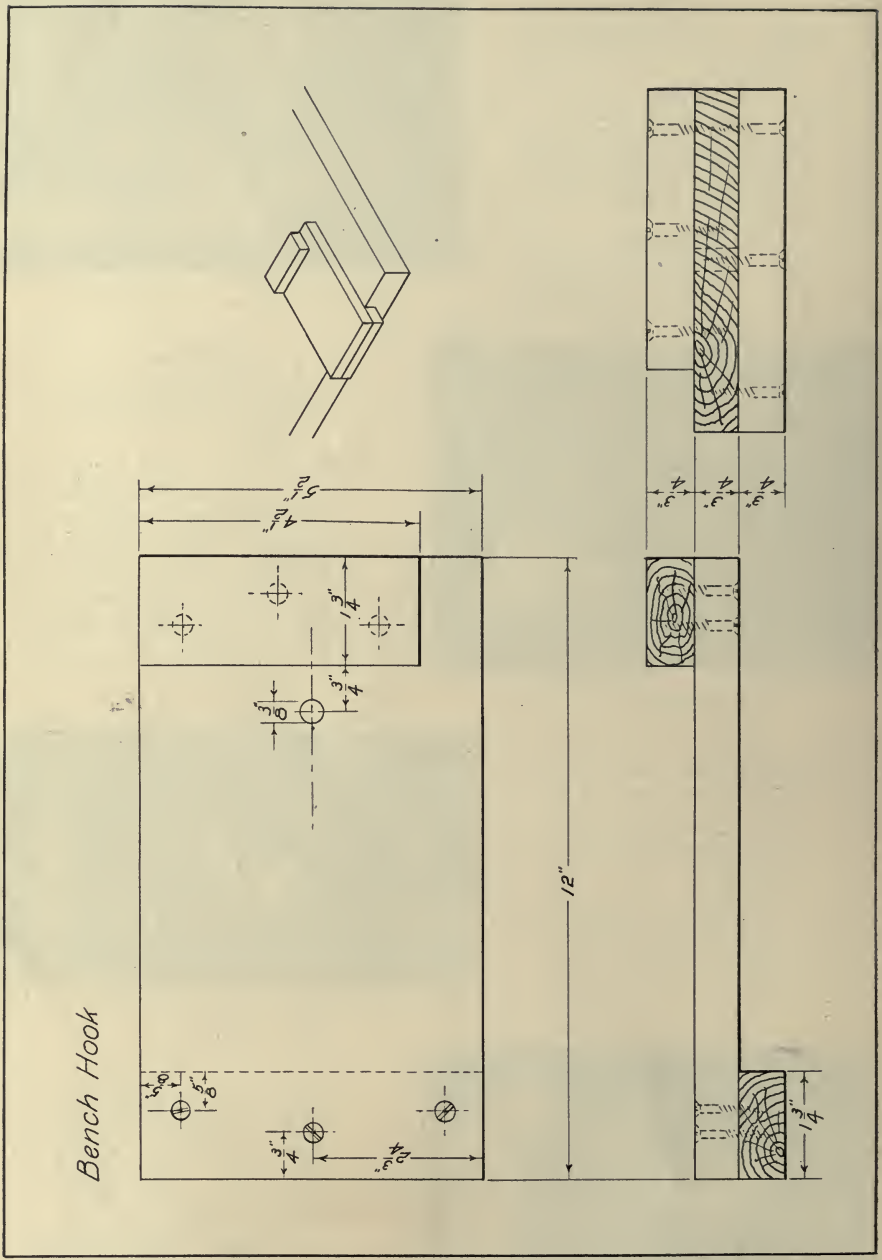
3—Draw a line across edge and end at each corner 1 inch from the corner so that the proper amount of stock may be removed.

4—Remove stock at corner with $\frac{3}{4}$ inch chisel, cutting with the grain. Fig. 8.

Fig. 9. Boring a Hole.

Fig. 10. Feeling for the Point of the Bit.

5—Locate a point $\frac{3}{4}$ inch from one end on a center line drawn lengthwise of the stock and bore hole with $\frac{3}{8}$ inch bit. Bore from one side until the point of the bit comes through, then turn the board and finish from the other side. This prevents splitting of the wood around the hole. Fig. 9, Fig. 10.


Bench Hook
5½"
4½"
12"
1¾"
¾"
⅜"
⅝"
⅜"
⅝"
¾"
¼"
¾"
¾"
¾"
¾"
1¾"

BENCH HOOK

Material Required

Lumber: 1 piece white or yellow pine, $\frac{13}{16}$x5$\frac{5}{8}$x10$\frac{1}{2}$ inches.

1 piece white or yellow pine $\frac{13}{16}$x1$\frac{7}{8}$x11 inches.
(Cypress or Oregon pine may be substituted for white or yellow pine.)

Hardware: 6 flat head bright wood screws 1$\frac{1}{4}$ inch, No. 8.

Fig. 12. Setting a Plane.

Directions

1—Reduce all pieces to finished dimensions.

2—Draw a center line lengthwise of big piece.

3—Locate a point on line just drawn 2$\frac{1}{4}$ inches from one end and bore $\frac{3}{8}$ inch hole.

4—Locate points on each of the small pieces for screws.

5—Bore holes for screws with $\frac{7}{32}$ inch twist bit and countersink the holes.

6—Clamp all pieces accurately in position in vise and assemble with screws. If white pine or other soft wood is used the screws may be forced into the large piece without drilling a hole, but if yellow pine or other hardwood is used a hole should be made for starting the screw with a smaller bit than that used for the shank of the screw.

The screw driver should be held straight and pressed firmly so as not to mar the slot in the screw.

The hole for the head of the screw should be countersunk so that the head is slightly below the surface of the wood.

Fig. 11. Position to Hold Sand Paper and Sand Paper Block.

Tools

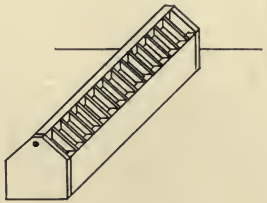
Sharp lead pencil, rule, try square, jack plane, handy saw, brace, $\frac{3}{8}$ inch bit, No. $\frac{7}{32}$ inch twist drill, countersink, screw driver.

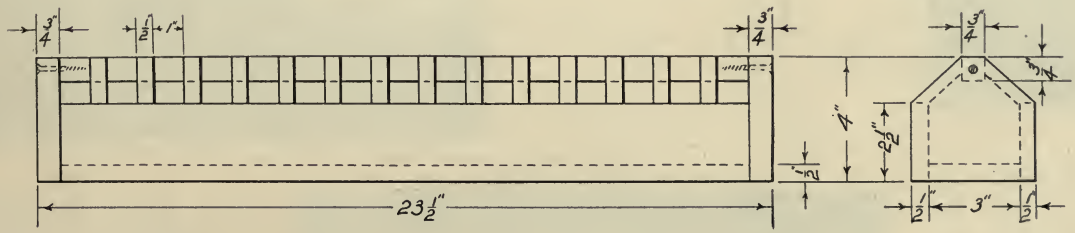
Stock Bill

Pieces.	Finished Dimensions.
1.	$\frac{3}{4}$x5$\frac{1}{2}$x10 in.
1.	$\frac{3}{4}$x1$\frac{3}{4}$x 5$\frac{1}{2}$ in.
1.	$\frac{3}{4}$x1$\frac{3}{4}$x 4$\frac{1}{2}$ in.

Fig. 13. Countersinking a Hole.

Feeding Trough for Chicks





FEEDING TROUGH FOR CHICKS

Material Required

Lumber: 1 piece cypress, white pine or basswood, $\frac{13}{16}$x4$\frac{1}{8}$x9 inches.
1 piece cypress, white pine or basswood, $\frac{13}{16}$x$\frac{13}{16}$x22$\frac{1}{2}$ inches.
1 piece cypress, white pine or basswood, $\frac{1}{2}$x9x30 inches.
(Poplar or redwood may be substituted for cypress, white pine or basswood.)

Hardware: 2 flat head bright wood screws, 1$\frac{1}{2}$ inch No. 10.
5 dozen $\frac{7}{8}$ inch brads.
16 1$\frac{1}{4}$ inch brads.
12 4d finishing nails.

Tools

Sharp lead pencil, rule, try square, T bevel, jack plane, hammer, brace, $\frac{3}{16}$ inch twist drill, countersink, nail set, screw driver.

Fig. 14. Proper Position to Hold Screw Driver.

Stock Bill

Pieces.	Finished Dimensions.	Use.
2.	$\frac{3}{4}$x4 x4 inches.	Ends.
1.	$\frac{3}{4}$x $\frac{3}{4}$x22 inches.	Ridge.
1.	$\frac{1}{2}$x3 x22 inches.	Bottom.
2.	$\frac{1}{2}$x2$\frac{1}{2}$x22$\frac{1}{2}$ inches.	Sides.
28.	$\frac{1}{2}$x $\frac{1}{2}$x 2$\frac{1}{4}$ inches.	Partitions.

Fig. 15. Ripsawing on a Saw Horse.

Directions

1—Reduce all pieces to finished dimensions.

2—To make the end cuts of the partitions hold the saw at 45° to a right angle.

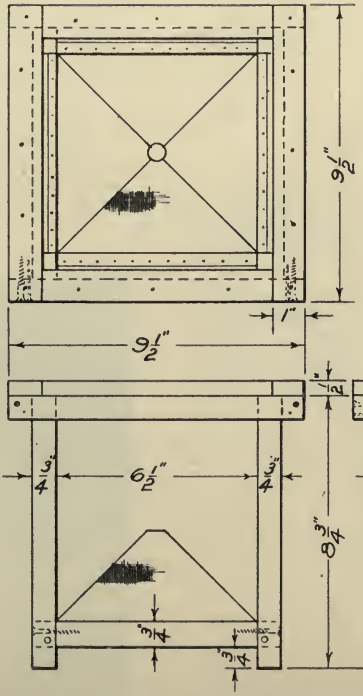
3—Fasten ends to ridge with 1$\frac{1}{2}$ inch No. 10 screw. Use $\frac{3}{16}$ inch twist drill for screw hole and countersink hole.

4—Fasten ends to sides and bottom with six 4d finishing nails at each end.

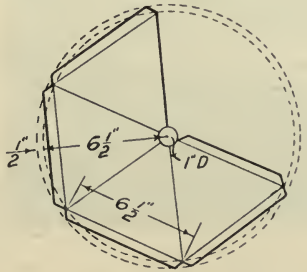
5—Nail sides to bottom with 1$\frac{1}{4}$ inch brads. Use eight brads at each side spaced evenly.

6—Fasten partitions by using one $\frac{7}{8}$ inch brad at each end.

Fly Trap



Pattern for Screen



Lay out whole pattern
Cut on heavy lines
Fold on light lines

FLY TRAP

Material Required

Lumber: 1 piece white pine, cypress or basswoood ⅞x8x24 inches.
1 piece white pine or basswood ½x1⅛x36 inches.

Hardware: 16 flat head bright wood screws 1½ inch, No. 8.
4 dozen carpet tacks.
1 piece wire fly screen 14 inches square.
16 brads 1¼ inch, No. 18.
14 shingle nails.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace and ⅛ inch twist drill, countersink, screw driver, hammer, nail set, compass.

Stock Bill

Pieces	Finished Dimensions	Use
4	¾x ¾x8¾ inches.	Corners.
8	¾x ¾x6½ inches.	Cross Pieces.
2	¾x ¾x9½ inches.	Top.
2	¾x ¾x8 inches.	Top.
2	½x1 x9½ inches.	Top.
2	½x1 x7½ inches.	Top.

Fig. 16. Cross Sawing on a Saw Horse.

Directions

1—Reduce all pieces to finished dimensions.

2—Assemble box part of trap by using one flat head screw 1½ inch No. 8, and one brad 1¼ inch No. 16 at each joint. The hole for the screw should be made about half the length of the screw with the 5-32 inch twist drill and then countersunk. The two screws at each corner must be placed a little above and below center respectively so as not to strike each other.

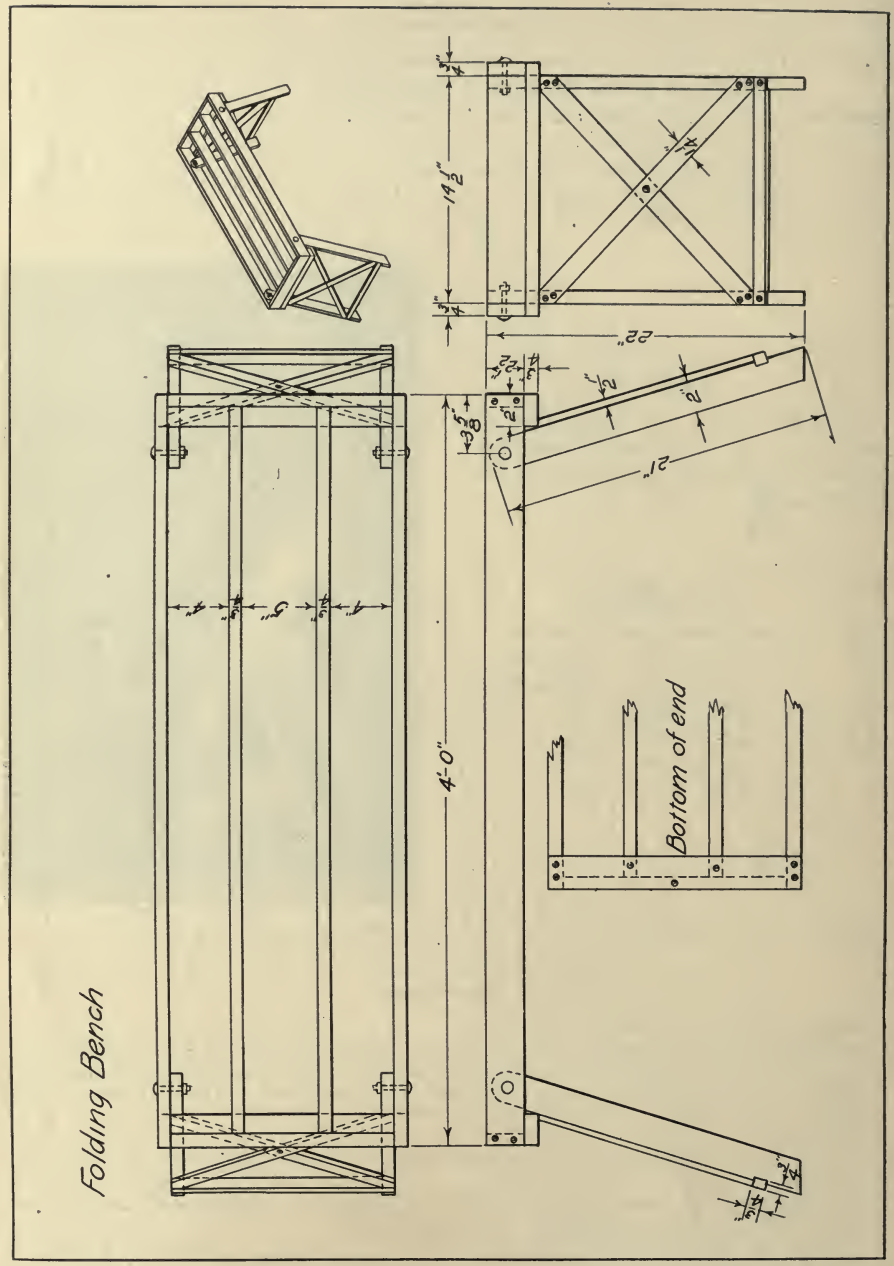
3—Place a brad at each joint at least ¼ inch from the screw so as to prevent the stock from turning.

4—Assemble the four ¾ inch pieces for the top same as box and nail the 1 inch strip as shown in the drawing with shingle nails.

5—Lay out the pattern for the screen on any piece of paper and cut the screen to the pattern with scissors or knife.

6—Sew the pattern together at the joint with a wire torn from the edge of the screen.

7—Tack screen in place with carpet tacks.


Folding Bench
14½"
22"
12"
4'-0"
Bottom of end

FOLDING BENCH

Material Required

Lumber: 1 piece cypress or white pine $\frac{13}{16}$x8 inches x 9 ft. 6 inches.
1 piece cypress or white pine $\frac{1}{2}$x1$\frac{1}{4}$ inches x 7 feet.
(Oregon pine or Southern pine may be substituted for cypress or white pine.)

Hardware: 30 flat head bright wood screws 1$\frac{3}{4}$ inches, No. 10.
16 flat head bright wood screws 1 inch, No. 7.
4 carriage bolts and washers $\frac{3}{8}$x2 inches.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, $\frac{3}{8}$ inch bit, $\frac{3}{16}$ inch and $\frac{1}{8}$ inch twist drills, countersink, $\frac{3}{4}$ inch chisel, rip saw, screw driver, pliers, dividers.

Stock Bill

Pieces	Finished Dimensions.	Use.
2.	$\frac{3}{4}$x2$\frac{1}{2}$x 4 feet 0 inches.	Sides.
2.	$\frac{3}{4}$x2$\frac{1}{2}$x 3 feet 10$\frac{1}{2}$ inches.	Platform.
2.	$\frac{3}{4}$x2$\frac{1}{2}$x14$\frac{1}{2}$ inches.	Ends.
4.	$\frac{3}{4}$x2 x21 inches.	Legs.
2.	$\frac{3}{4}$x2 x16 inches.	End cross piece.
2.	$\frac{3}{4}$x $\frac{3}{4}$x14$\frac{1}{2}$ inches.	Lower cross piece.
4.	$\frac{1}{2}$x1 x21 inches.	End braces.

Directions

1—Reduce all pieces to finished dimensions.

2—Fasten ends to four long pieces by using two 1$\frac{3}{4}$ inch No. 10 screws at each joint. Bore holes for screws with $\frac{3}{16}$ inch twist bit and countersink holes.

3—Fasten end lower cross piece by placing five screws as shown in the drawing.

4—Locate points for bolts on side pieces 1$\frac{1}{8}$ inches from top edge and 3$\frac{5}{8}$ inches from end and bore hole with $\frac{3}{8}$ inch bit.

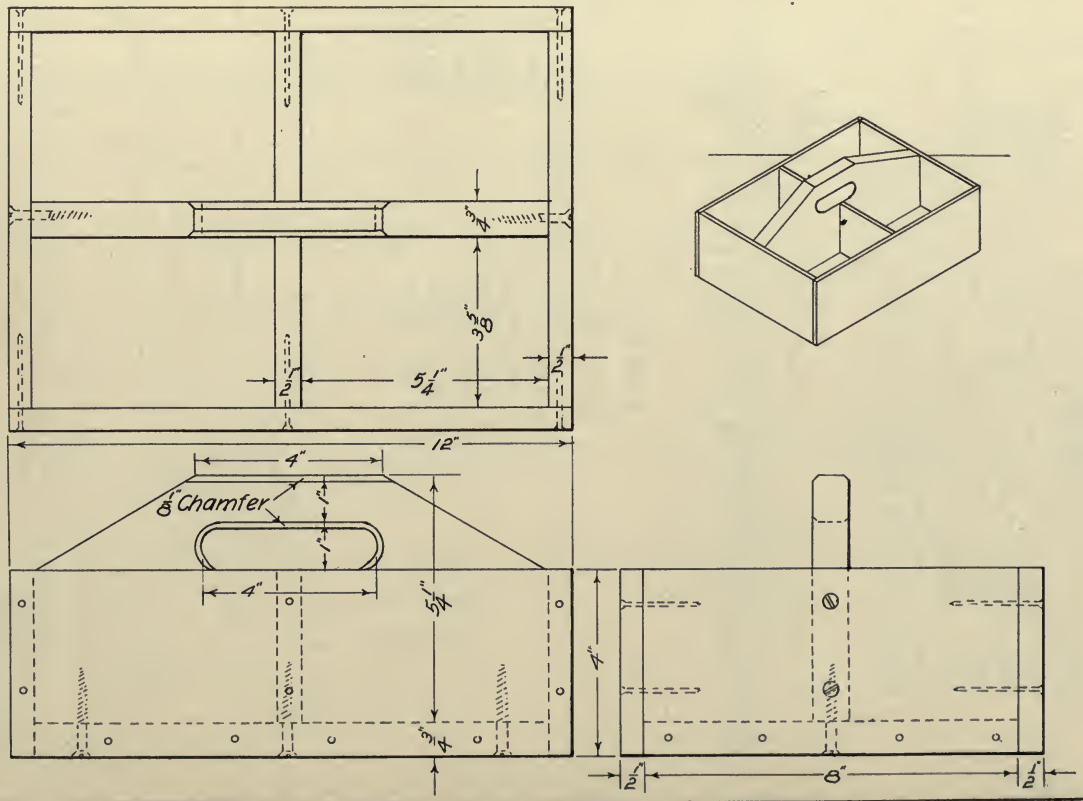
5—Bore $\frac{3}{8}$ inch holes in legs at end for bolts.

6—Cut notch $\frac{1}{4}$ inch deep and $\frac{3}{4}$ inch wide in upper edge of legs 2 inches from end and fasten cross piece in place with one 1$\frac{3}{4}$ inch screw at each joint.

7—Lay out cross braces, making half lap joint at center and fasten with two 1 inch No. 7 screws at each joint, and one $\frac{3}{8}$ inch screw at half lap joint.

8—Fasten legs to top with bolts.

Nail and Staple Box



NAIL AND STAPLE BOX

Material Required

Lumber: 1 piece white pine or basswood ⅞x8¼x11½ inches.
1 piece white pine or basswood ⅞x5½x11½ inches.
1 piece white pine or basswood ½x4 inches by 4 feet 2 inches.
(Redwood, poplar or cypress may be substituted for white pine or basswood.)

Hardware: 5 flat head bright wood screws 1½ inches, No. 8.
3 dozen 4d finishing nails.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace and 5-32 inch twist drill, countersink, 1 inch bit, screw driver, hammer, ¾ inch chisel.

Fig. 17. Holding the Plane at an Angle to Cut a Chamfer.

Stock Bill

Pieces.	Finished Dimensions.	Use.
1.	¾x8 x11 inches.	Bottom.
1.	¾x5¼x11 inches.	Partition and handle.
2.	½x4 x12 inches.	Sides.
2.	½x4 x 8 inches.	Ends.
2.	½x3¼x 3⅝ inches.	Cross partitions.

Directions

1—Reduce all pieces to finished dimensions.

2—To lay out opening for hand draw a line lengthwise of stock 1½ inches from upper edge, also draw a center line crosswise of stock. Measurements should be made on line running lengthwise of stock from center line. Locate points on line 1½ inches from center line and bore 1 inch holes. Remove as much as possible of the remaining stock with 1 inch bit and trim opening with ¾ inch chisel.

3—In making partition and handle first reduce piece to ¾x5¼x11 inches. To lay out the slant draw two lines across upper edge 3½ inches from ends and a line across each end 2 inches from upper edge. Connect lines just drawn with lines on both sides.

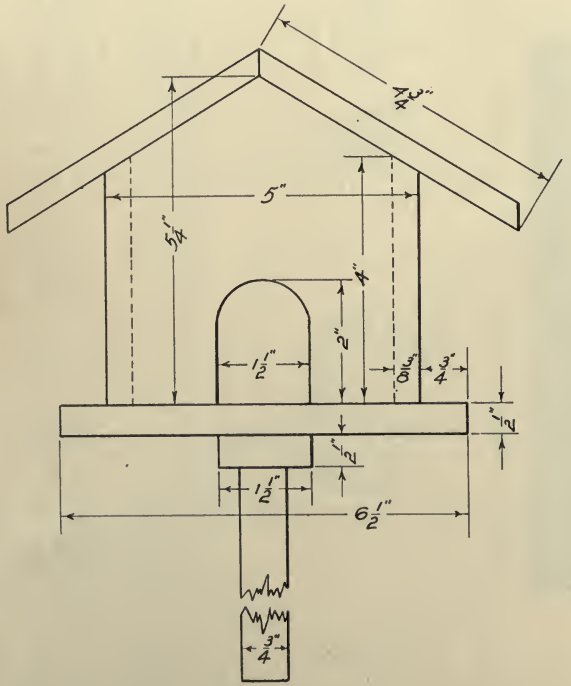
4—Lay out ⅛ inch chamfer on upper edge and both ends of opening with pencil and remove stock with chisel.

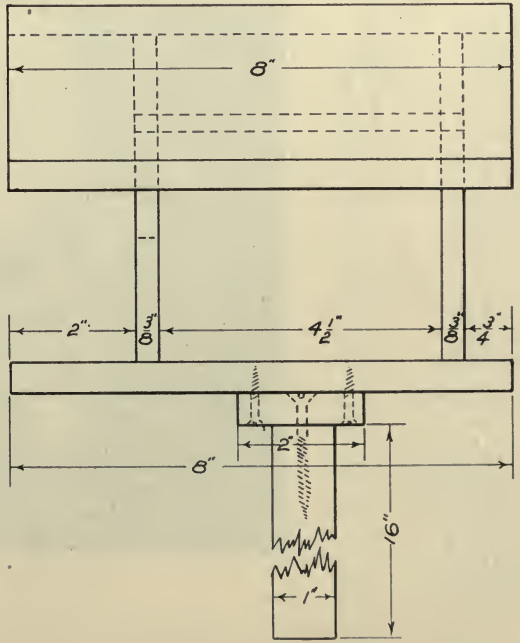
5—Remove stock for slant with saw and trim to line with plane.

6—Lay out ⅛ inch chamfer on corners of upper edge and remove stock with plane.

7—Assemble box by placing nails and screws as shown in drawing.

Bird House





BIRD HOUSE

Material Required

Lumber: 1 piece white pine or basswood $\frac{3}{8}$x5$\frac{1}{4}$ inches x 3 feet 2 inches.
1 piece white pine or basswood $\frac{1}{2}$x8$\frac{1}{4}$x8$\frac{1}{2}$ inches.
1 piece white pine or basswood $\frac{7}{8}$x1$\frac{1}{8}$x16$\frac{1}{2}$ inches.
(Poplar, cypress or redwood may be substituted for pine or basswood.)

Hardware: 1 flat head bright wood screw 2 inch No. 12.
4 flat head bright wood screws $\frac{7}{8}$ inch No. 7.
1 dozen 1$\frac{1}{4}$ inch brads No. 18.
2 dozen 1 inch brads No. 18.

Tools

Sharp lead pencil, rule, try square, jack plane, handy saw, brace, coping saw, twist drills, 7-32 inch and $\frac{1}{8}$ inch countersink, screw driver, hammer, nail set, T bevel.

Stock Bill

Pieces.	Finished Dimensions.	Use.
1.	$\frac{1}{2}$x6$\frac{1}{2}$x 8 inches.	Bottom.
2.	$\frac{3}{8}$x5 x 5$\frac{1}{4}$ inches.	Ends.
2.	$\frac{3}{8}$x4$\frac{1}{2}$x 4 inches.	Sides.
2.	$\frac{3}{8}$x4$\frac{3}{4}$x 8 inches.	Roof.
1.	$\frac{1}{2}$x1$\frac{1}{2}$x 2 inches.	Brace.
1.	$\frac{3}{4}$x1 x16 inches.	Post.

Directions

1—Reduce all pieces to finished dimensions.

2—To make doorway draw a center line lengthwise of end piece and swing a circle with compass using point on center line 1$\frac{1}{4}$ inches from end as center.

3—Draw lines at right angle to end tangent to sides of circle.

4—Remove stock for doorway using handy saw to cut to circle and coping saw to make the circle.

Fig. 18. Setting Nail with Nail Set.

5—Set the T bevel at the same angle as shown in the drawing and lay out the slant for the gable of end pieces.

6—With T bevel in same position as for gables lay out bevels on upper edge of both sides and both edges of two pieces for roof.

7—Fasten brace to post with 2 inch No. 12 screw. Holes for flat head screws should always be bored and countersunk.

8—Fasten brace and post to bottom with four $\frac{7}{8}$ inch No. 7 screws as shown in drawing.

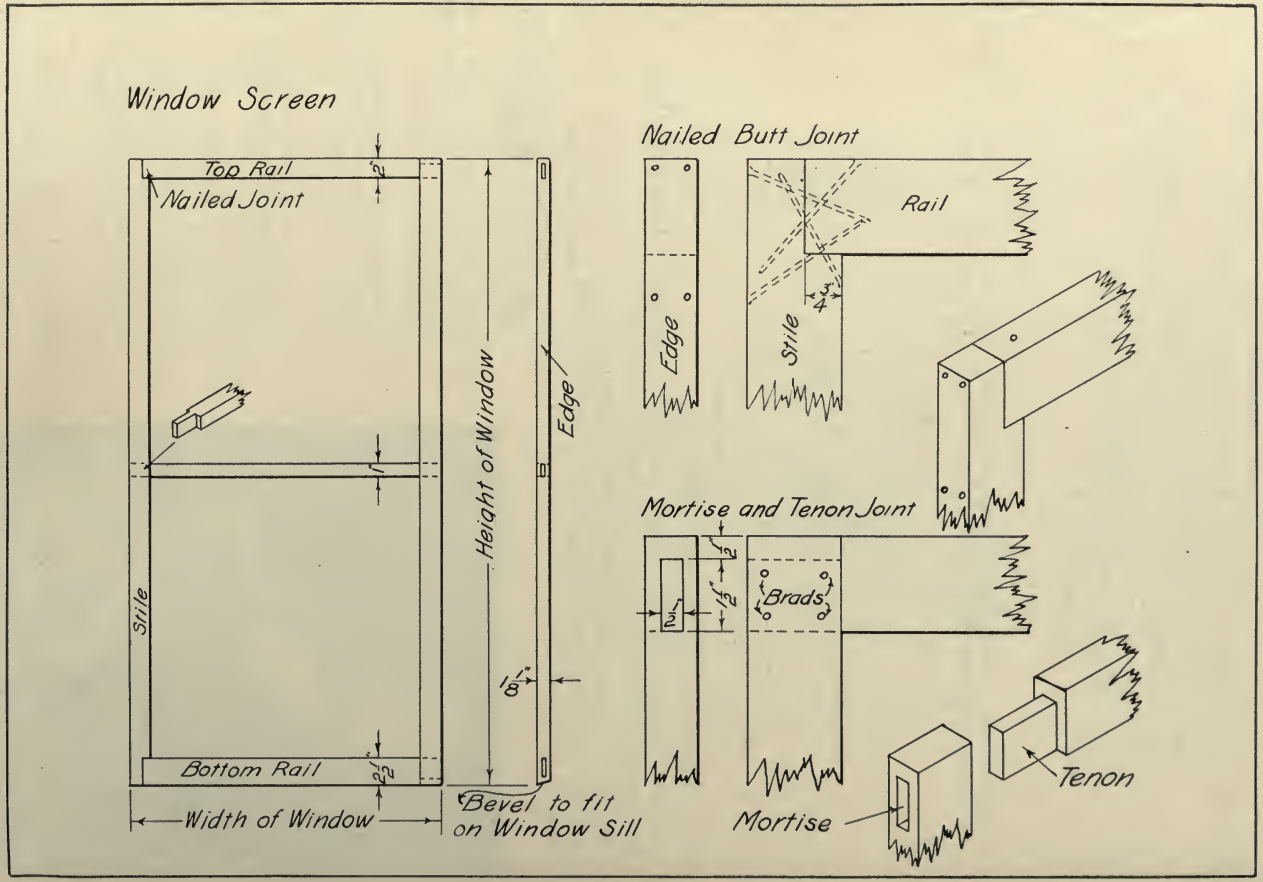
9—Nail ends to sides by using three 1 inch brads at each joint.

10—Draw lines on lower side of bottom piece where brads are to be placed so that when driven through bottom they will enter sides and ends.

11—Nail bottom, ends and sides by using three 1 inch brads at each side and back and two at front.

12—Fasten top in place by using seven 1 inch brads for each side.

13—Set brads with nail set.


Window Screen
Top Rail
Nailed Joint
Stile
Height of Window
Edge
Bottom Rail
Width of Window
Bevel to fit on Window Sill
Nailed Butt Joint
Edge
Rail
Stile
Mortise and Tenon Joint
Brads
Mortise
Tenon

WINDOW SCREEN

Material Required for Each Window

Lumber: 1 piece white pine or cypress 1⅛x2½ inches by width of window for bottom rail.
1 piece white pine 1⅛x2 inches by width of window plus twice the length of window for top rails and stiles.
1 piece white pine 1⅛x1 inch by width of window for middle rail.
Enough screen moulding to cover edges of screen and middle rail.

Hardware: Twenty 10d casing nails, if nailed joint is used; 1 package No. 16 brads if mortise and tenon joint is used and for nailing moulding; package of carpet tacks for screen; wire fly screen; paint.

The finished dimensions are not given here as they must be obtained by measuring the window where the screen is to fit.

The mortise and tenon joint is the stronger and better way of joining the screen at the corners, yet a nailed joint holds the members firmly in place if the nails are well placed at an angle as shown in the drawing. The screen need lap only far enough on the sides and ends to be securely nailed. It should not project outside of the moulding which is placed on the inside edge of the sides and ends and across the middle rail.

The painting should be done carefully so as to prevent moisture from getting into the joints.

Fig. 19. Position of Chisel and Mallet for Mortising.

Fig. 20. Method for Holding Chisel in Mortising.

TOOL SHARPENING

There are three distinct operations in sharpening a plane, bit or chisel; first, grinding, Fig. 21; second, whetting the beveled side, Fig. 22; third, removing the wire edge from the plain side, Fig. 23.

In grinding a plane iron loosen the cap screw with a screw driver and set the lever cap back on the plane iron so that it will be out of the way when removing the wire edge from the plain side.

Fig. 21. Grinding a Chisel.

The plane iron or cutter should be held on the grinder so that the edge will be a perfect right angle with the side. It should be held firmly in one position so that only one bevel will be formed. In grinding, the tool should be moved from side to side on the grinder so as to prevent wearing the stone unevenly.

In whetting the beveled side of the chisel or plane iron it should be held firmly in both hands as indicated in Fig. 22 and given three or four forward strokes, pressing the iron firmly on to the stone. Do not move the wrists for this motion. The movement should occur at the elbow and by the swaying of the body forward and back.

Fig. 22. Whetting the Beveled Side of a Chisel.

Fig. 23. Removing the Wire Edge from the Plain Side of a Chisel.

To remove the wire edge, lay the flat side of chisel or plane iron, flat on the oil stone as shown in Fig. 23 and move it back and forth three or four strokes. Under no circumstances should the end of the iron be raised or lowered so that it won't lie flat on the stone.

Until one becomes thoroughly familiar with tool sharpening the whetting of both beveled and plain sides may need to be done more than once to insure a good cutting tool.

SAW FILING

The first operation in sharpening a saw is that of jointing the saw, Fig. 24. The purpose of this is to bring all teeth to an even length. This is done by drawing a flat file across the teeth of the saw. One or two strokes is usually sufficient. The file must be held perfectly square; this may be facilitated by use of a block called a saw jointer, as shown in Fig. 24.

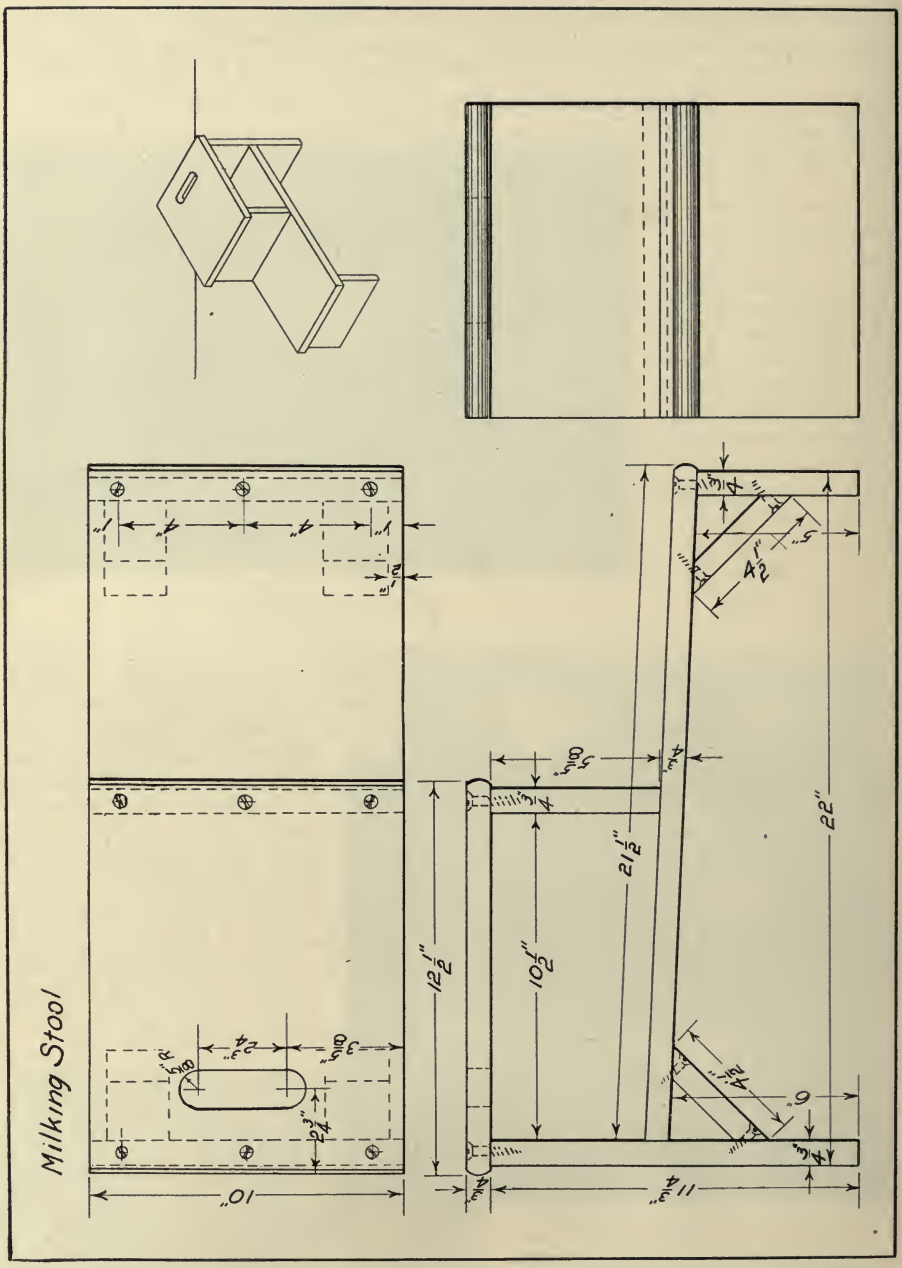
The second operation in saw sharpening is that of setting the saw. This consists of bending the teeth outward, one on one side, the next on the other and so on till all the teeth are bent. The set should not extend more than half the length of the tooth. For ordinary work the teeth should be set about one-third the thickness of the blade. For dry lumber the saw will require less set than for green or wet lumber.

Fig. 24. Jointing a Saw.

The third operation is that of filing the saw. In filing a cross-cut saw the point of the file should point toward the point of the saw at an angle of about 45 degrees. In filing a rip saw the file is held straight across the saw. File every tooth to a point, one-half of the filing being done from each side, being careful to stop filing a tooth when it has been brought to a point. File the entire length of the saw from one side, then reverse the saw and file from the other side. The front edge of each tooth projecting away from the filer and the back edge of the tooth next ahead, should be filed with the same stroke. Only forward strokes of the file should be used.

Fig. 25. Filing a Saw.

The fourth operation consists of placing the saw flat on a smooth surface, as the top of a bench, and running a whetstone over the teeth so as to remove the burr from the teeth caused by filing.


Milking Stool
10"
24"
3 1/2"
2 3/4"
1 1/2"
4"
1"
1/2"
12 1/2"
10 1/2"
21 1/2"
22"
5 1/2"
3/4"
11 3/4"
6"
4 1/2"
5"

MILKING STOOL

Material Required

Lumber: 1 piece white pine $\frac{13}{16}$″x10″x5′ 3″.
(Cypress or redwood may be substituted for white pine.)

Hardware: 15 flat head bright wood screws, $1\frac{3}{4}$″ No. 10. 16 flat head bright wood screws, $1\frac{1}{4}$″ No. 8 for braces.

Stock Bill

Pieces.	Finished Dimensions:	Use.
1.	$\frac{3}{4}$″x10″x12$\frac{1}{2}$″	Seat.
1.	$\frac{3}{4}$″x10″x11$\frac{3}{4}$″	Back Leg.
1.	$\frac{3}{4}$″x10″x5″	Front Leg.
1.	$\frac{3}{4}$″x10″x21$\frac{1}{2}$″	Pail Rest.
1.	$\frac{3}{4}$″x10″x5$\frac{5}{8}$″	Front Seat Support.
4.	$\frac{3}{4}$″x 2″x4$\frac{1}{2}$″	Braces.

Directions

1. Reduce all pieces to finished dimensions.

2. Round both ends of the seat and the front end of the pail rest to lines drawn across the stock on both sides $\frac{1}{8}$″ from the end.

3. Locate points on seat for hand hole as shown in the drawing and at these points swing circles with $\frac{5}{8}$″ radius. Draw lines tangent to the circles.

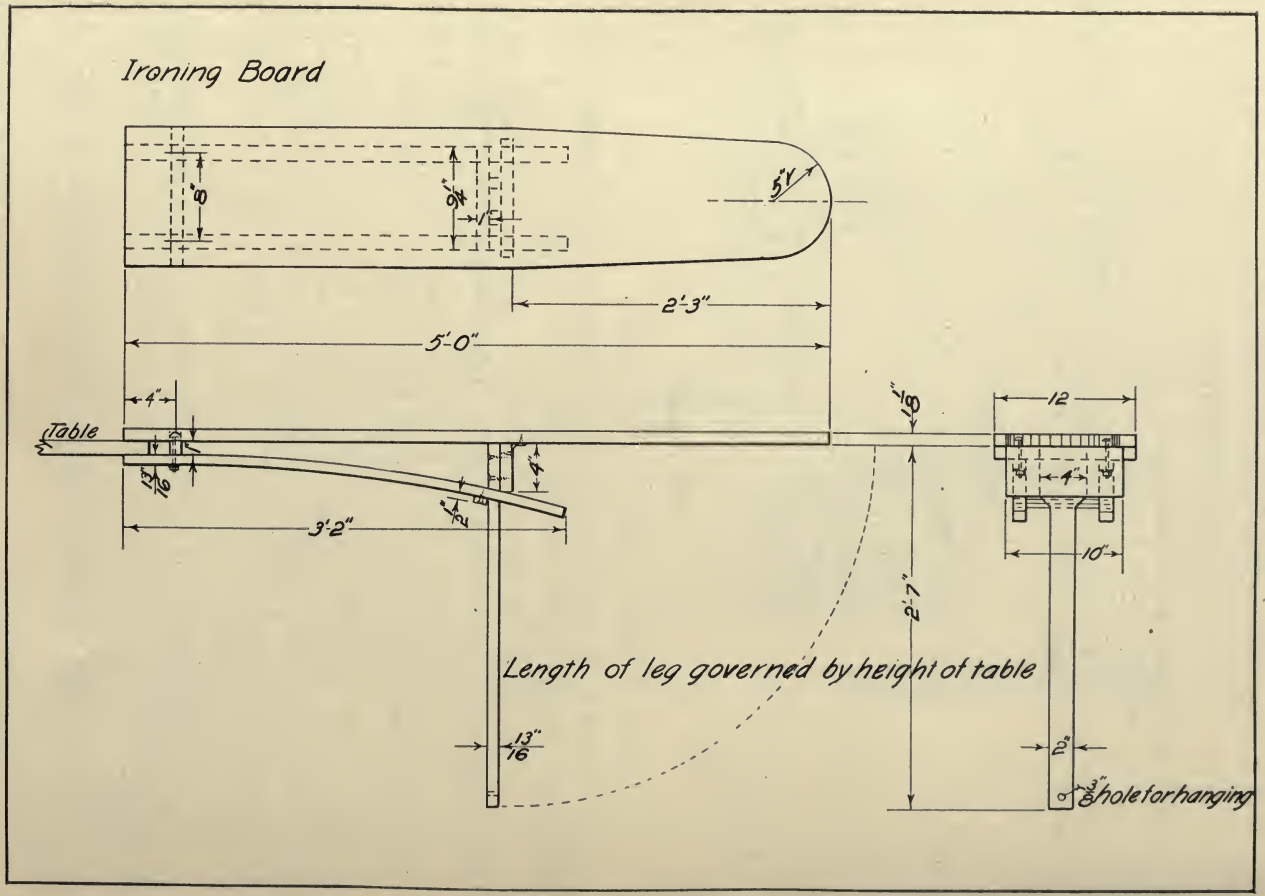
4. Bore a hole with $\frac{1}{2}$″ bit so that the outside of the $\frac{1}{2}$″ hole touches the outside edge of the circle and cut the opening with a coping saw.

5. Set the T bevel for the bevel cuts at the back end of the pail rest, the lower end of the front seat support, the upper end of the front leg and the upper end of the braces from the drawing and cut ends to the bevels. The lower ends of the braces are 45 degree cuts and may be laid out by setting the T bevel at 45 degrees on the steel square.

6. Bore three holes for $1\frac{3}{4}$″ No. 10 screws at each joint spaced as shown in the drawing with 3-16″ wood twist drill; countersink the holes and assemble the parts.

7. Bore 5-32″ holes for screws in braces; countersink the holes and fasten the braces.

The stool may be assembled by using four 6d common nails at each joint and two 6d common nails at each end of each brace; however the screws are a better form of construction.


Ironing Board
8"
9¾"
5"R
2'-3"
5'-0"
4"
Table
1"
13/16
3'-2"
4"
1½"
1"
12
4"
10"
2'-7"
Length of leg governed by height of table
13/16"
2"
3/8" hole for hanging

IRONING BOARD

Material Required

Lumber: 1 piece white pine, poplar or basswood, $1\frac{1}{8}$″x12″x5′ 0″.
1 piece white pine, poplar or basswood, $\frac{13}{16}$″x4″x3′ 6″.
1 piece birch or oak $\frac{13}{16}$x$1\frac{1}{4}$″x8′ 4″.
Hardware: 2 carriage bolts $\frac{1}{4}$″x$2\frac{1}{2}$″ with 2 washers each.
4 flat head bright wood screws $1\frac{1}{4}$″, No. 8.
2 flat head bright wood screws $\frac{7}{8}$″, No. 7.
2 steel butt hinges, riveted, with $1\frac{1}{8}$″ screws.

Stock Bill

Pieces.	Finished Dimensions	Use.
1.	$1\frac{1}{8}$″x12″x5′ 0″	Board.
2.	$\frac{13}{16}$″x$1\frac{1}{4}$″x3′ 2″	Clamps.
1.	$\frac{13}{16}$″x1″x12″	Parting Strip.
1.	$\frac{1}{2}$″x1″x$9\frac{1}{4}$″	Cross bar.
1.	$\frac{13}{16}$″x4″x2′ 7″	Post.
1.	$\frac{13}{16}$″x4″x10″	Post and Hinge Support.

Directions

1. Reduce all pieces to finished dimensions.

2. To shape the board draw a center line lengthwise of stock and swing an arc with 5″ radius on center line 5″ from end.

3. Draw lines across both edges 2′ 3″ from the same end as the arc.

4. Remove stock to line with saw, draw knife and plane.

5. Locate points for bolts 4″ from end and 2″ from edge and bore a 11-16″ hole $\frac{1}{2}$″ deep on the upper edge of board.

6. Bore $\frac{1}{4}$″ holes thru the board in center of 11-16″ holes, and thru the parting strips and clamps.

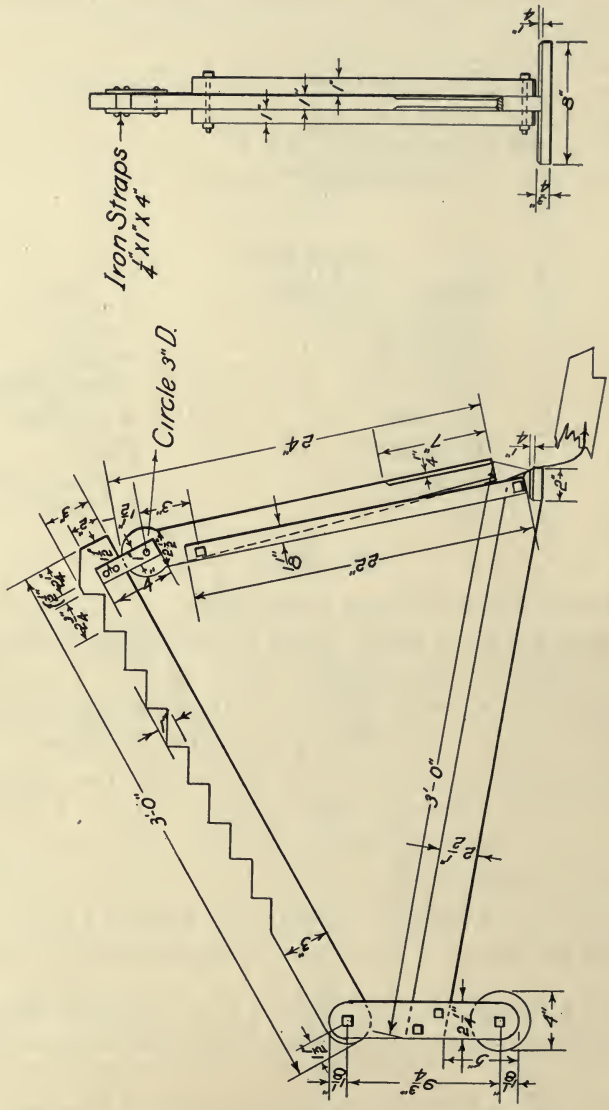
7. Bolt these three members in place and plug the 11-16″ holes.

8. Fasten the post to the post and hinge support with four $1\frac{1}{4}$″ No. 8 screws.

9. Cut a small groove in the lower side of the board and also in the edge of the post and hinge support for the joint of the hinges and fasten the hinges.

10. Place the board on the bench and the post standing up at right angle to the board and fasten the cross bar to the clamps so that it touches the post.

11. Bore the $\frac{3}{8}$″ hole in the lower end of post for hanging the board.



Wagon Jack.

WAGON JACK

Material Required

Lumber: 1 piece oak, birch, maple or other hardwood 1″x6″x6′ 6″.
Hardware: 6 machine bolts $\frac{3}{8}$″x3$\frac{1}{2}$″ with washers.
2 flat head, bright wood screws 1$\frac{1}{2}$″, No. 10.
2 pieces of iron $\frac{1}{4}$″x1″x4″.
3 iron rivets $\frac{1}{4}$″x1$\frac{3}{4}$″.

Stock Bill

Pieces.	Finished Dimensions	Use
1.	1″x3″x3′-0″	Top.
1.	1″x2$\frac{1}{2}$″x3′-0″	Main Brace.
2.	1″x2$\frac{1}{4}$″x12″	Front Standards.
2.	1″x1$\frac{1}{8}$″x22″	Back Standards.
1.	1″x3″x24″	Lever.
1.	$\frac{3}{4}$″x2″x8″	Foot.
1.	$\frac{7}{8}$″x4″x4″	Wheel.

Directions

1. Reduce all pieces to finished dimensions.

2. Round one end of the top by swinging an arc on a centerline at one end with a radius of one and one-half inches, and remove stock with saw and chisel.

3. Lay out axle notches by drawing lines across the upper edge of the top two and three-quarters inches apart, and another line on the side of the stock one inch from the top edge. Cut the notches with the rip and cross-cut saws.

4. Round the ends of the front standards by swinging arcs on a centerline one and one-eighth inches from the end with a one and one-eighth inch radius.

5. Find the center of the piece for the wheel by drawing lines diagonally across the stock, and swing the circle with the compass set at a 2 inch radius.

6. Lay out the lower end of the main brace as shown in the detail drawing to fit the foot, and cut the upper end at a bevel.

7. Lay out and cut a one-quarter inch chamfer around the upper edge of the foot excepting where it fits into the main brace.

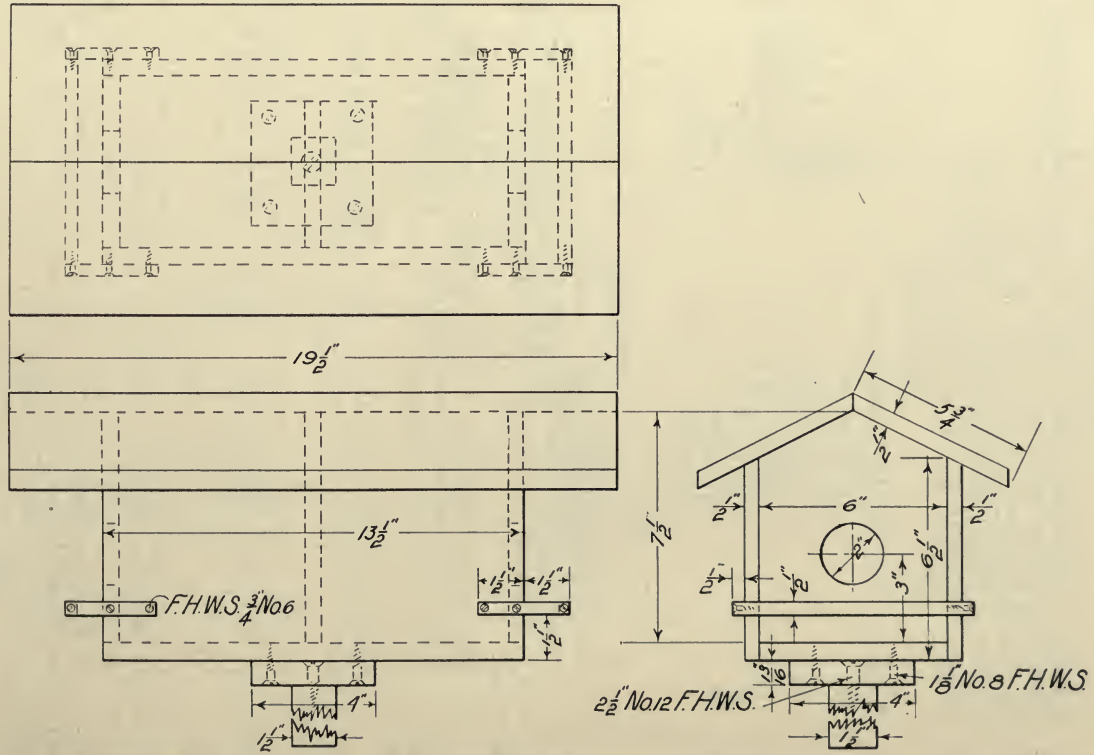
8. Swing a circle on a centerline drawn lengthwise of the lever, one and one-half inches from the upper end with the compass set at one and one-half inch radius; taper the lever to one and one-half inches at the lower end, and remove the stock to line. Lay out and cut a one-quarter inch chamfer at all four corners of the lever as shown in the drawing.

9. Fasten the foot to the main brace with two one and one-half inch No. 10 flat head, bright wood screws.

10. Bore holes with three-eighths inch bit for bolts at positions shown in the drawing and assemble parts with bolts.

11. Bore one-quarter inch holes for rivets of iron plate at center of circle of lever, as shown in the drawing at upper end, and fasten plates by riveting in position.

Community Bird House



COMMUNITY BIRD HOUSE

Material Required

Lumber: 1 piece white pine or basswood $\frac{1}{2}''$x$6\frac{1}{2}''$x9′ 4″.
1 piece white pine or basswood $\frac{13}{16}''$x4″x4″.
1 piece white pine or basswood $1\frac{1}{2}''$x$1\frac{1}{2}''$x16″.
(Poplar, cypress or redwood may be substituted for white pine or basswood.)
Hardware: 1 flat head bright wood screw $2\frac{1}{2}''$, No. 12.
4 flat head bright wood screws $1\frac{1}{8}''$, No. 8.
$2\frac{1}{2}$ doz. brads $1\frac{1}{4}''$, No. 18, for bottom and sides.
$1\frac{1}{2}$ doz. 6d finishing nails for roof.

Stock Bill

Pieces.	Finished Dimensions.	Use.
1.	$\frac{1}{2}''$x6″x$13\frac{1}{2}''$	Bottom.
2.	$\frac{1}{2}''$x$6\frac{1}{2}''$x$13\frac{1}{2}''$	Sides.
3.	$\frac{1}{2}''$x6″x$7\frac{1}{2}''$	Ends and partition.
2.	$\frac{1}{2}''$x$5\frac{3}{4}''$x$19\frac{1}{2}''$	Roof.
1.	$\frac{13}{16}''$x4″x4″	Support for post.
1.	$1\frac{1}{2}'$x′$1\frac{1}{2}''$x16″	Post
2.	$\frac{1}{2}''$x$\frac{1}{2}''$x7″	Perch
4.	$\frac{1}{2}''$x$\frac{1}{2}''$x3″	Perch supports.

Directions

1. Reduce all pieces to finished dimensions.

2. To make doorway locate a point for center as indicated in drawing and draw a circle with the compass. Bore a hole with $\frac{1}{4}''$ bit so that the outside edge of the hole touches the circle. Place a coping saw blade thru the $\frac{1}{4}''$ hole, fasten blade in frame and saw the circle.

3. To lay out the slant on partition and end pieces for gable set the T bevel at the same position as shown in the drawing.

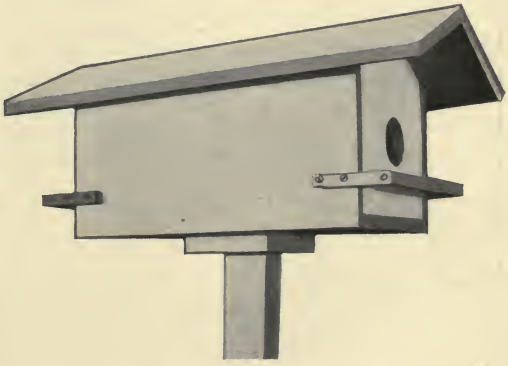


Fig. 26. Community Bird House.

4. Lay out the bevels at ridge and eaves of roof boards with T bevel set the same as for end pieces.

5. Fasten brace to post with one flat head bright wood screw $2\frac{1}{2}''$, No. 12.

6. Drill holes for screws with 5-32″ wood twist drill $\frac{1}{2}''$ from end and $\frac{1}{2}''$ from side at each corner of brace and fasten brace and post to bottom with four flat head bright wood screws $1\frac{1}{4}''$, No. 8.

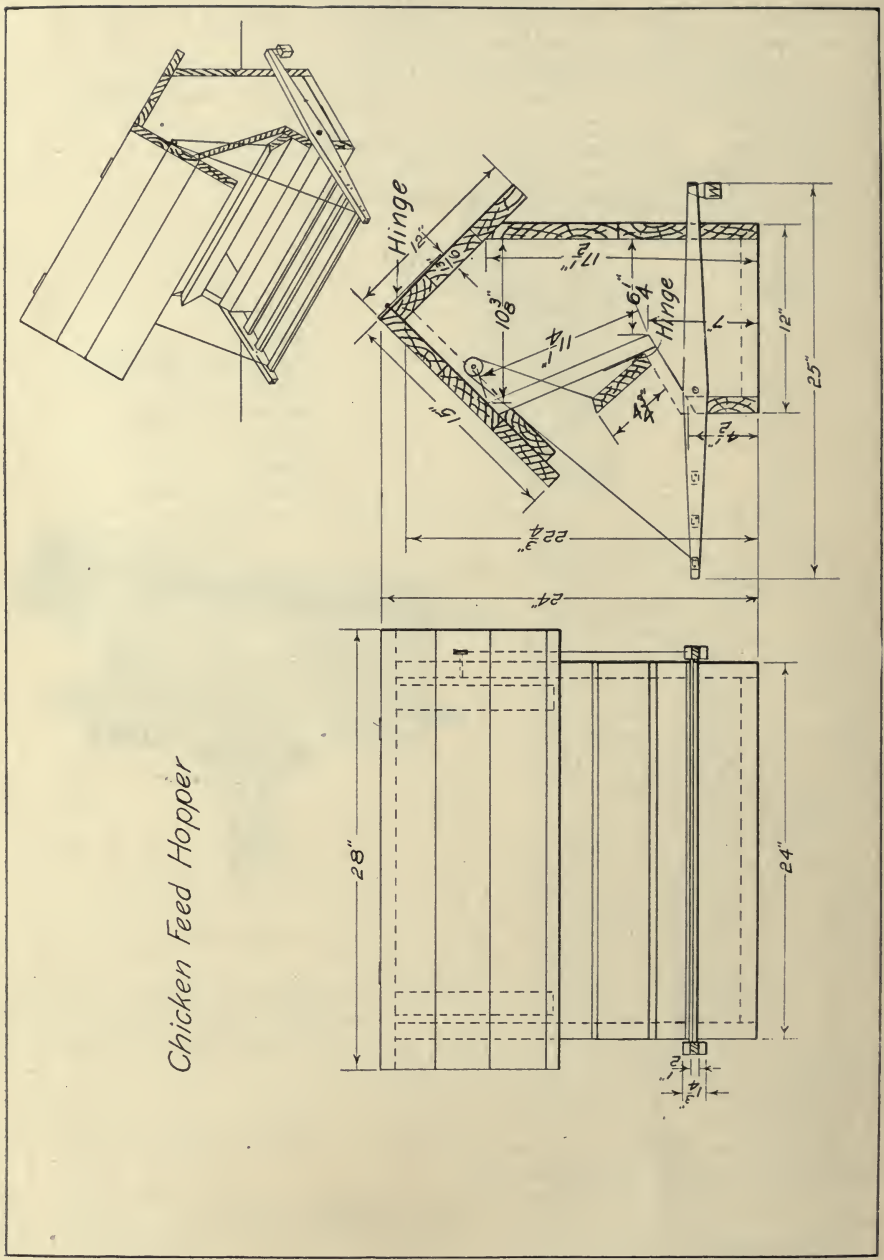
7. Fasten ends and partition to bottom with four $1\frac{1}{4}''$ No. 18 brads at each joint.

8. Fasten sides to ends and partition by using five brads on each side at the bottom and three at each end.

9. Fasten roof by using three 6d finishing nails at each joint. All nails and brads should be spaced evenly and driven straight so as not to run out at the side.

10. In boring the holes for the $\frac{3}{4}''$ screws in the perch supports the wood should be clamped in the vise so as to prevent splitting.

11. Fasten perches with $\frac{3}{4}''$ No. 6 flat head bright wood screws as shown in the drawing.


Chicken Feed Hopper
Hinge
Hinge
28"
24"
24"
25"
12"
19"
22¾"
10¾"
11½"
11¼"
7"
4½"
2"
2"

CHICKEN FEED HOPPER

Material Required

Lumber: 2 pieces white pine 1″x12″x12′ 0″.
Redwood or cypress may be substituted for white pine.
Hardware: ½ lb. 8d common nails.
1 round-head blued wood screw 1¼″ No. 10.
2 round-head blued wood screws 1¾″ No. 10.
1 doz. 6d common nails.
1 doz. 6d finishing nails.
2 pair 6″ light T hinges.
32″ of heavy cord.
Small piece of wire for fastening weight.
2 small screw eyes for fastening cord.

Stock Bill

Pieces.	Finished Dimensions	Use.
1.	⅞″x10⅜″x22⅜″	Bottom.
2.	⅞″x10⅜″x22¾″	Ends.
2.	⅞″x8¾″x24″	Back.
1.	⅞″x4½″x24″	Front at bottom
1.	⅞″x11¾″x24″	Front.
1.	⅞″x4¾″x24″	Door.
1.	⅞″x11 3/16″x2′ 4″	Top.

Pieces.	Finished Dimensions.	Use.
1.	⅞″x7″x2′ 4″	Top door.
1.	⅞″x8″x2′ 4″	Top door.
2.	⅞″x2″x13″	Cleats for door.
2.	⅞″x1¾″x2′ 1″	Levers.
3.	½″x⅞″x24¼″	Perches.
1.	½″x2″ D. Circle	Pulley.

Directions

1. Reduce all pieces to finished dimensions.

2. Nail the ends to the bottom by using three nails at each joint.

3. Nail the boards for the back in place and bevel the upper edge of the upper board so that the roof will fit on it snugly.

4. Bevel the lower edge of the front board to fit against the end boards; fasten with three nails at each end and bevel the upper edge same as upper edge of back.

5. Nail the front board at bottom and bevel its upper edge.

6. Fasten the top by driving two nails into each end board and four into the back.

7. Nail the cleats to the door using at least six 6d common nails for each cleat. The nails should be driven at a slant so as not to come thru.

8. Cut notches in the upper edges of front to receive the cleats when the door is closed.

9. Fasten hinges to door and door to top.

10. Bevel the top edge of the lower door to fit front; fasten door by placing the strap part of the hinges against the box and bevel the front edge of the door.

11. Fasten the three perches to the lever, by driving two 6d finishing nails thru the lever into each end.

12. Place the levers driving a one and three-quarter inch, No. 10 round-head blued wood screw thru its center, and into the end of the hopper at points shown in the drawing.

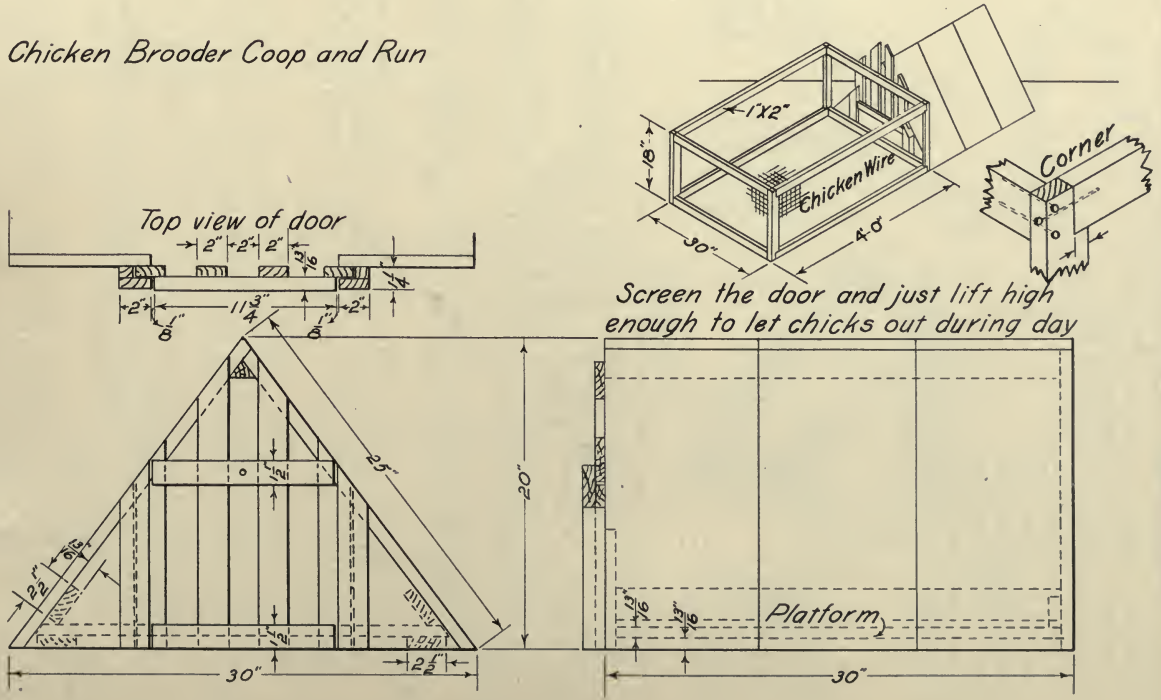
13. Fasten a screw eye into the upper edge of one lever at the front end, and another into the upper front edge of the lower door.

14. Make a pulley for the cord by sawing a two-inch circle with the coping saw; cut a groove to receive the cord in the face of the pulley with round file or chisel. Bore a hole thru the center of the pully the size of a two-inch, No. 10 screw and fasten in position shown in drawing.

15. Fasten cord to screw eyes and run over the pulley.

16. Hang a weight at the back end of the levers of sufficient weight to lower the door.

Chicken Brooder Coop and Run



CHICKEN BROODER COOP AND RUN

Material Required

Lumber: 1 piece $\frac{13}{16}$″x9″x10′ 0″ white pine, Oregon pine, cypress or redwood.
1 piece $\frac{13}{16}$″x2½″x10′ 0″ white pine, Oregon pine, cypress or redwood.
1 piece $\frac{13}{16}$″x2″x7′ 6″ white pine, Oregon pine, cypress or redwood.
1 piece $\frac{13}{16}$″x1½″x2′ 0″ white pine, Oregon pine, cypress or redwood.
1 piece ⅞″x1″x2′ 0″ white pine, Oregon pine, cypress or redwood.

Hardware: ¼ lb. 4d common nails.
1 lb. 6d common nails.
21 lineal ft. 18″, 1″ mesh chicken wire.
¼ lb. ¾″ poultry netting staples.

Stock Bill

Pieces.	Finished Dimensions	Use.	Pieces.	Finished Dimensions	Use.
3.	$\frac{13}{16}$″x9″x28⅜″	Platform.	3.	$\frac{13}{16}$″x10″x25″	Roof.
4.	$\frac{13}{16}$″x2½″x27″	Cleats for bottom and sides.	3.	$\frac{13}{16}$″x10″x24¼″	Roof.
			1.	$\frac{13}{16}$″x10″x20″	Back.
2.	$\frac{13}{16}$″x2″x19″	Middle door slats.	2.	$\frac{13}{16}$″x9″x18″	Back.
			1.	$\frac{13}{16}$″x2½″x23″	Cleat for back.
2.	$\frac{13}{16}$″x2″x13½″	Side door slats.	2.	$\frac{13}{16}$″x1½″x11¾″	Cleats for door.
2.	$\frac{13}{16}$″x2″x12″	Front piece of slot for door.	4.	$\frac{13}{16}$″x2″x3′ 9″	Run sides.
2.	⅞″x1″x11″	Back piece of slot for door.	4.	$\frac{13}{16}$″x2″x2′ 4⅜″	Run ends.
			4.	$\frac{13}{16}$″x2″x18″	Run posts.

Fig. 27. Chicken Brooder Coop and Run.

Directions

1. Reduce all pieces to finished dimensions and label each piece. Labels should be written neatly with letters about the size used in writing on paper. Careless writing does not look well on woodwork.

2. Fasten bottom cleats to bottom by driving two 6d common nails in each board at each end. The nails are longer than the thickness of the boards and should be driven at a slant so as not to go thru.

3. Fasten cleats to roof boards same as bottom and drive two nails into each board at the ridge.

4. For laying out the slant on upper end of pieces for back and front the T bevel should be used and may be set at the same angle as the drawing.

5. Fasten cleat to back pieces the same as bottom and roof; set back pieces in place and nail thru edge of back roof board.

6. Nail the two lower front pieces firmly in place by nailing thru edge of front roof board and one nail in end of roof board cleat.

7. Place cleats for door as shown in "Top view of door" and fasten with 6d nails.

8. Fasten cleats to door by using two 4d common nails at each joint. Take a few shavings from the side of the side pieces so the door may slide freely.

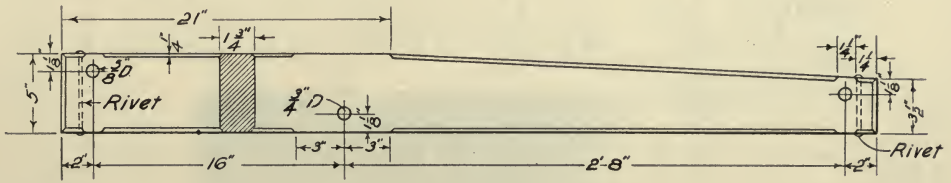
9. Cut the ends of the corner posts of the run as shown in the detail drawing and join the corners with three 6d common nails placed as shown in detail of corner. Assemble the sides and ends first.

10. In fastening the wire begin at one corner and run the wire around the run, cutting the opening for the door as wide as the door and eight inches high. Do not cut the bottom strand of wire. Staples should be placed not more than 6 inches apart.

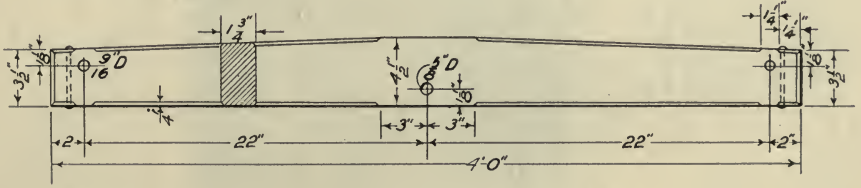
11. Run the wire lengthwise at the top and fasten with staples at the end and sides.

12. Bore a ⅜ inch hole thru the upper door cleat at the center. A peg placed in this hole may rest on the upper end piece of the run and hold the door open. A similar hole thru a slat of the door and into the front edge of the front roof board furnishes a place for the peg to hold the door open when the run is not in use. A brooder coop should be built so that the roof may be removed and the platform thoroly cleaned.

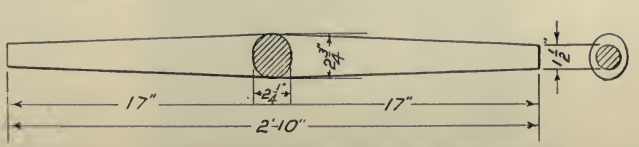
Three Horse Evener

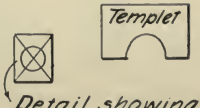


Two Horse Evener



Singletree





THREE-HORSE EVENER

Lumber: 1 piece select hickory $1\frac{3}{4}''$x5''x4′ 4″. (If hickory is not available, white ash may be used.)

Hardware: 1 iron rivet $\frac{1}{4}''$x$3\frac{3}{4}''$ with 2 washers.

1 iron rivet $\frac{1}{4}''$x$5\frac{1}{4}''$ with 2 washers.

Directions

1. Reduce stock to $1\frac{3}{4}''$x5''x4′ 4″.
2. Lay out the taper for the one-horse end by drawing a line from a point on the back edge of the stock 21″ from the two-horse end to a point on the one-horse end $3\frac{1}{2}''$ from the front edge.
3. Remove the stock to line with saw and plane.
4. Lay out and cut a $\frac{1}{4}''$ chamfer on the edges of the stock as indicated in the drawing.
5. Bore $\frac{1}{4}''$ holes for the rivets $1\frac{1}{4}''$ from ends and fasten rivets by securely riveting them.
6. Locate points 2″ from ends and $1\frac{1}{8}''$ from back edge of stock and bore $\frac{5}{8}''$ holes for clevises.
7. Locate a point 18″ from the two-horse end and $1\frac{1}{8}''$ from the front edge, and bore a $\frac{3}{4}''$ hole for main clevis pin.

TWO-HORSE EVENER

Lumber: 1 piece select hickory or ash $1\frac{3}{4}''$x$4\frac{1}{2}''$x4′ 0″.

Hardware: 2 iron rivets $\frac{1}{4}''$x$3\frac{3}{4}''$.

Directions

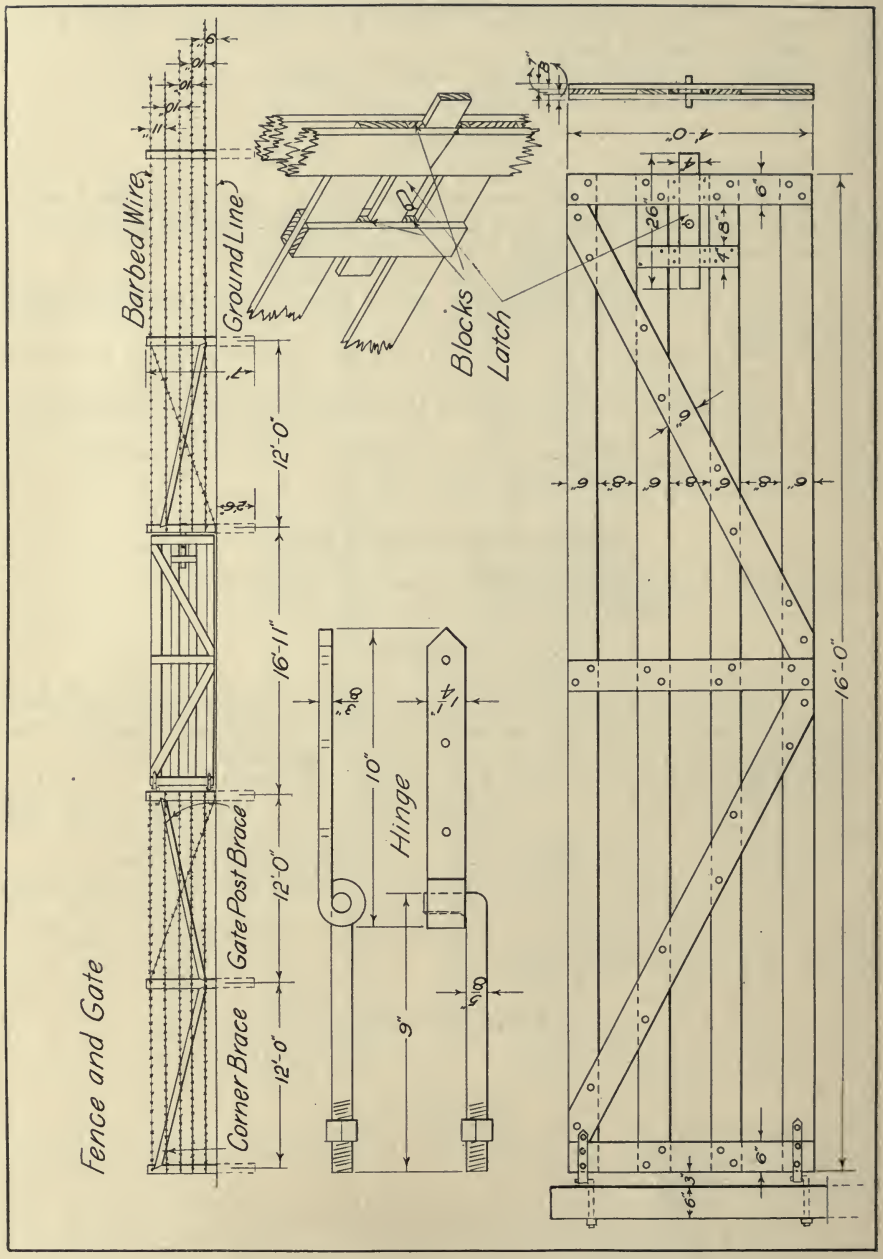
1. Reduce stock to $1\frac{3}{4}''$x$4\frac{1}{2}''$x4′ 0″.
2. Lay out the taper by drawing lines across the back edge of the stock 21″ from each end and lines across both ends $3\frac{1}{2}''$ from the front edge and connecting the lines by lines drawn on the sides of the stock.
3. Remove the stock to line with the saw and plane.
4. Lay out and cut a $\frac{1}{4}''$ chamfer on the edges of the stock as indicated in the drawing.
5. Bore $\frac{1}{4}''$ holes for the rivets $1\frac{1}{4}''$ from ends and place rivets.
6. Locate points 2″ from ends and $1\frac{1}{8}''$ from back edge of stock and bore 9-16″ holes for clevises.
7. Locate a point 24″ from either end and $1\frac{1}{8}''$ from the front edge and bore a $\frac{5}{8}''$ hole for the main clevis pin.

SINGLETREE

Lumber: 1 piece of hickory or ash $2\frac{1}{4}''$x$2\frac{3}{4}''$x2′ 10″.

Directions

1. Square up the stock to finished dimensions.
2. Find the center at each end by drawing lines diagonally as shown in the detail drawing.
3. Draw a circle at center of each end $1\frac{1}{2}''$ in diameter.
4. Cut a templet of pasteboard as shown in the detail drawing and use in getting the singletree a perfect oval at the center.
5. In removing the stock, bring it to a square at the end, then an octagon and then a circle. Remove the bulk of the stock with the saw and finish with the plane. The singletree may be sanded to produce a smooth finish.


Fence and Gate
Barbed Wire
Ground Line
Corner Brace
Gate Post Brace
12'-0"
16'-11"
12'-0"
12'-0"
Hinge
10"
9"
Blocks
Latch
16'-0"

FENCE AND GATE

Material Required

Lumber: 5 pieces white or yellow pine $\frac{7}{8}$″x6″x16′ 0″.
2 pieces white or yellow pine $\frac{7}{8}$″x6″x14′ 0″.
1 piece white or yellow pine $\frac{7}{8}$″x4″x6′ 0″.
1 piece round hardwood $\frac{5}{8}$″x6″.
(Oregon pine or cypress may be substituted for white or yellow pine.)
Hardware: 2 pair screw hook and strap hinges.
26 carriage bolts $\frac{3}{8}$″x3″.
16 carriage bolts $\frac{3}{8}$″x2″.
23 6d common nails.

Stock Bill

Pieces.	Finished Dimensions.	Use.
4.	$\frac{7}{8}$″x6″x16′ 0″	Horizontal pieces.
6.	$\frac{7}{8}$″x6″x4′ 0″	Vertical pieces.
2.	$\frac{7}{8}$″x6″x8′ 3″	Braces.
2.	$\frac{7}{8}$″x4″x20″	Uprights for latch
1.	$\frac{3}{4}$″x4″x2′ 2″	Latch.
2.	$\frac{7}{8}$″x2″x4″.	Blocks above and below latch.
2.	$\frac{7}{8}$″x2″x6″	Blocks above and below latch.
1.	$\frac{5}{8}$″ round x 6″ long	Knob.

Directions

1. Reduce all pieces to finished dimensions.

2. Fasten the vertical pieces to the horizontal pieces by placing two $\frac{3}{8}$″x3″ carriage bolts at each joint.

3. Fasten the braces to the horizontal members by using two $\frac{3}{8}$″x2″ carriage bolts at places indicated in the drawing.

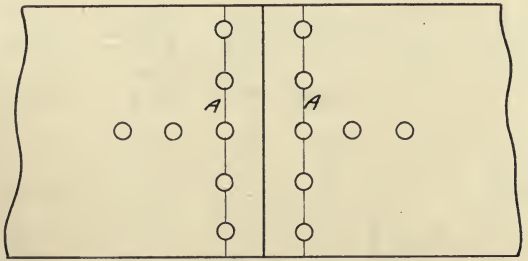
4. Bore a $\frac{5}{8}$″ hole in the center of the latch for the knob; place knob in position and fasten by driving a 6d nail into the upper edge of the latch so that the point of the nail will go into the knob.

5. Place latch in position.

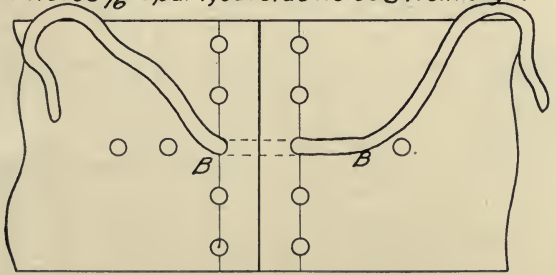
6. Assemble the uprights for the latch to the two middle horizontal pieces 8″ from the front end vertical piece by driving two 6d common nails at each end from each side.

7. In like manner fasten the blocks above and below the latch, as shown in the detail drawing, using two 6d nails from each side.

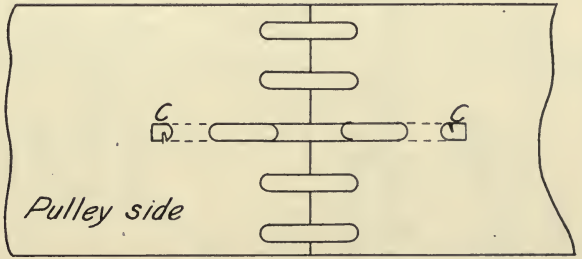
Lacing a Belt with a Rawhide Thong



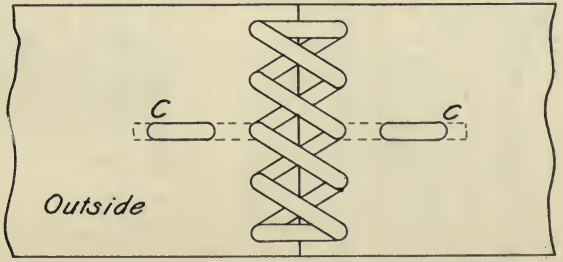
Cut ends to be laced perfectly square
Draw lines, AA, $\frac{5}{8}$" from ends and punch
5 holes $\frac{13}{16}$" apart; outside holes $\frac{3}{8}$" from edge.



Draw thong through center holes and
bring ends up tight

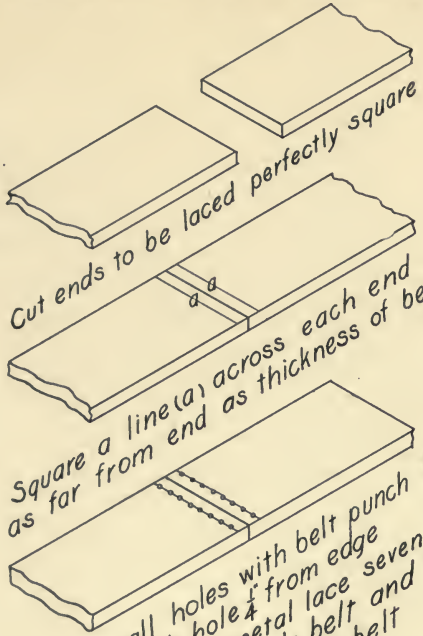


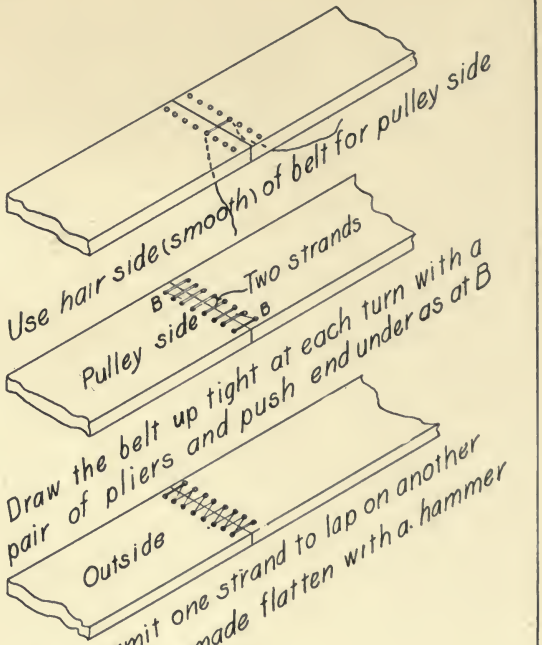
Commence as at B B and lace each way
keeping lace from twisting; lace to be
double on pulley side and end at C, C.



Cut lace after passing through holes,
C, C, and nick with knife so it won't slip out.

Lacing a Belt with Metallic Wire Belt Lacing


Cut ends to be laced perfectly square
a a
Square a line (a) across each end as far from end as thickness of belt
Punch small holes with belt punch ⅜" apart placing outside hole ¼" from edge
It takes a piece of metal lace seven times the width of a single belt and nine times for a double belt


Use hair side (smooth) of belt for pulley side
B
Two strands
Pulley side
B
Draw the belt up tight at each turn with a pair of pliers and push end under as at B
Outside
Do not permit one strand to lap on another
After joints are made flatten with a hammer

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